skr. **29**: 1–25. *pls. 1, 2.* 1908) have published 19 new species of fungi; these are based on collections made in the Danish West Indies by C. RAUNKIAER during the years 1905 and 1906. W. FAWCETT and A. B. RENDLE (Journ. Botany **47**: 3–8. 1909) have published diagnoses of 12 new species of orchidaceous plants from Jamaica; these are preliminary to a monograph of the orchids of Jamaica. E. ULE (Engl. Bot. Jahrb. **42**: 191–238. 1908), in collaboration with different specialists, under the title *Beiträge zur Flora von Bahia I*, has published 75 species and one variety as new to science; these are referred to families in the Engler sequence from the Bromeliaceae to the Araliaceae and include the following new genera: *Sincoraea* and *Cryptanthopsis* (Bromeliaceae), *Heptocarpum* (Capparidaceae), and *Itatiaia* (Melastomaceae). E. KOEHNE (*ibid.* Beiblatt 97: 47–53) records 5 new species and 4 new varieties in the Lythraceae from South America, Africa, and Siam. Different authors (Kew Bull. **1908**: 432–441), under the title *Diagnoses Africanae XXVI*, have published 19 new species and one variety of African angiosperms, including 2 new genera (*Aristogeitonia* and *Androstachys*) of the Euphorbiaceae; also (*ibid.* 445–451) in *Decades kewensis: Decas LI*, 10 new species are described from various localities. E. L. GREENE (Leaflets Bot. Obs. & Crit. **2**: 1–24. 1909) proposes a series of 60 new species and 3 new varieties of flowering plants, chiefly from western United States. J. BORNMÜLLER (Mitt. Thür. Bot. Ver. **23**: 1–27. 1908), in continuation of his contributions under the title *Novitiae Florae Orientalis*, has published 23 species as new to science, of which 17 belong to the genus Astragalus. A. SCHERFFEL (Ber. Deutsch. Bot. Gesells. **26a**: 762–771. 1909), proposes a new genus (*Asterococcus*) for the alga hitherto known as *Pleurococcus superbus* Cienk. N. L. BRITTON (Bull. N. Y. Bot. Gard. **5**: 311–318. 1909), in continuation of his studies on the flora of the Bahamas, has described 6 new species of flowering plants. F. S. EARLE (*ibid.* 373–451), under the title of *Genera of the North American Gill Fungi*, recognizes 147 genera for North America, and of these 38 are designated as new.—J. M. GREENMAN.

Hybrids of Oenothera.—DEVRIES has recently published several remarkable papers on hybridization in Oenothera. The results concern a new type of hereditary behavior, which is of great interest, showing as it does that we are only on the borderland of knowledge in these fields. Such discoveries, which open new vistas for the future, are of special value as a stimulus to research. The first of these papers appeared in this journal[11] and announced the discovery of what are called twin hybrids, and a later paper[12] dealt with triple hybrids. In certain cases, when one of the wild species of the Onagra group is crossed with *O. Lamarckiana* or one of its mutants, two types are produced in about equal numbers, both of which breed true, the same types appearing in the different crosses. These types DEVRIES calls *O. laeta* and *O. velutina*. In the case of *O. scintillans* and *O. lata*

[11] DEVRIES, HUGO, On twin hybrids. BOT. GAZETTE **44**: 401–407. 1907.

[12] ———, On triple hybrids. BOT. GAZETTE **47**: 1–8. 1909.

triple hybrids are produced—in addition to *O. laeta* and *O. velutina* a third type resembling the mother (*O. lata* or *O. scintillans*), but in its special marks intermediate between its parents.

The twin hybrids of *O. nanella* have been worked out most completely.[13] *O. muricata* × *O. nanella* produces the two types *laeta* and *velutina*, about 50 per cent. of each. The *laeta* breed true for four generations, but the *velutina* split in the F_2 and all succeeding generations, producing *velutina* and something over 50 per cent. of a form called by DEVRIES *O. murinella*, which is a dwarf *O. velutina* and breeds true. The dwarf character (but not the other *O. nanella* characters), therefore, reappears in over half of each generation. The discoveries of greatest interest follow. *O. velutina* × *O. murinella* gives the same results as *O. velutina* self-pollinated, i. e., over 50 per cent. *O. murinella*. From this the conclusion is drawn that the pollen of *O. velutina* has the same hereditary qualities as that of *O. murinella*. The reciprocal cross gave 100 per cent. *O. murinella* (280 plants). The facts are all explained by assuming that the egg cells of *O. velutina* are of hybrid (heterozygote) nature ($a \times b$), while the pollen bears only the dwarf character (a). On self-pollination *O. velutina* would then give 50 per cent. *O. velutina* ($a \times b$) and 50 per cent. *O. murinella* (a) which breed true. This conclusion is verified by crosses of *O. velutina* and *O. nanella* (since *O. velutina* × *O. nanella* gives 57 per cent. *O. murinella*, and *O. nanella* × *O. velutina* gives 100 per cent. *O. murinella*).

Similarly, *O. laeta* crossed with *O. murinella*, *O. nanella*, or *O. velutina* gives 50 per cent. *laeta* and 50 per cent. dwarfs. Therefore the egg cells of *laeta* are also hybrid (heterozygote) in regard to the dwarf character, although when self-pollinated *laeta* breeds true! The pollen of *laeta* therefore bears the hereditary characters for high stature. This dominates over the hybrid nature of its own egg cells, but is recessive to the egg cells of pure dwarfs. The remarkable situation therefore appears, that the egg cells of both *velutina* and *laeta* behave as heterozygotes, while the pollen of the former behaves as though it carried only the dwarf character, and the pollen of *laeta* appears to carry only the character for high stature.

Another paper[14] shows that the hybrids of *O. gigas* behave differently from those of other mutants. *O. gigas* × *O. Lamarckiana* forms a constant intermediate race. *O. Lamarckiana* × *O. gigas*, *O. gigas* × *O. brevistylis*, *O. gigas* × *O. rubrinervis*, and *O. rubrinervis* × *O. gigas* all give the same hybrid race. *O. lata* × *O. gigas*, however, gives two types, about half intermediate between *O. gigas* and *O. Lamarckiana*, and half intermediate between *O. gigas* and *O. lata*. *O. gigas* crossed with *O. biennis* and *O. muricata* produces intermediate sterile hybrids.

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[13] DEVRIES, HUGO, Ueber die Zwillingsbastarde von *Oenothera nanella*. Ber. Deutsch. Bot. Gesells. **26a**:667–676. 1908.

[14] ———, Bastarde von *Oenothera gigas*. Ber. Deutsch. Bot. Gesells. **26a**: 754–762. 1908.

Miss LUTZ[15] studied forty individuals of *O. lata* × *O. gigas* and describes a group of hybrids which probably include both the types of DEVRIES, and in addition plants like *O. lata* and like *O. gigas*, having their respective numbers of chromosomes.—R. R. GATES.

Nitrogen fixation by Azotobacter.—KRZEMIENIEWSKI has contributed a paper[16] that seems to throw much-needed light on the problems of nitrogen fixation by Azotobacter in the soil. Perhaps its most valuable feature is the demonstration of the accelerating influence of humus on the process. He finds that Azotobacter in pure cultures in ordinary nitrogen-free media can fix little atmospheric nitrogen, but that the addition of sterile soil or of humic acids or their calcium, potassium, or sodium salts to such solutions multiplies the amount of nitrogen fixed many times. It is interesting to note further that the humus derived from different soils does not yield uniform results, and that artificial "humus" formed by the action of acids on carbohydrates is of little or no value. LIPMAN[17] in this country has anticipated in part some of these results, for he found that the amount of nitrogen fixed by Azotobacter growing in solutions to which different types of soils had been added varied greatly. KRZEMIENIEWSKI further reaches the interesting conclusion, as a result of repeated experiments, that humus does not serve either as a source of nitrogen or of carbon for Azotobacter. He finds that the various nitrogen compounds used in an effort to duplicate the stimulating influence of humus are without such results. When these compounds were used in conjunction with humus they were found to be even decidedly inhibitory in action. Why the humus should thus stimulate growth of Azotobacter he fails to explain, although he seems to have had abundant experimental evidence of the fact. The author was able to demonstrate as much as seventeen milligrams of nitrogen fixed per gram of glucose used in carbohydrate solutions to which humus or humic acids had been added. This is a higher ratio than has been reported by other investigators. He further succeeded in demonstrating by gas analysis for the Azotobacter what was long ago demonstrated for the legume, an actual decrease in the amount of nitrogen supplied to the culture. The organic nitrogen fixed in the culture solution was found at the close of the experiment to check very closely with the amount which disappeared from the air.

The organism is a strict aerobe, neither alcohols, acids, nor hydrogen gas are found as products of metabolism. The ratio $\frac{CO_2}{O_2}$ approaches unity. The temperature optimum for nitrogen fixation is 28° C. Prolonged cultivation of Azotobacter on artificial media the author finds has little influence on its "viru-

[15] LUTZ, ANNE M., Notes on the first generation hybrid of *Oenothera lata* × *O. gigas*. Science N. S. **29**:263–267. 1909.

[16] KRZEMIENIEWSKI, S., Untersuchungen über *Azotobacter chroococcum*. Beij. Bull. Acad. Sci. Cracovie Cl. Sci. Math. et Nat. **1908**:299–1050. *pl. 1.*

[17] LIPMAN, JACOB G., Bacteriological indications of the mineral requirements of soils. Ann. Rep. N. J. State Agr. Exp. Sta. **27**:177–187. 1906.